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August 31, 1998

JMHLTR: #98-0236

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Dresden Nuclear Power Station Unit 3
Supplement to Unit 3 Manual Scram Due to Decreasing Condenser Vacuum Caused By A Stuck Open Turbine Crossaround Relief Valve
Licensee Event Report 1998-004-01
NRC Docket Number 50-249

The enclosed Licensee Event Report, which is a final report, describes a Manual RPS actuation due to Decreasing Condenser Vacuum. This condition is being reported pursuant to 10 CFR 50.73(a)(2)(iv) which requires the reporting of any event or condition that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

The following actions were taken:

1. After replacement of all internal parts, the CAR3 valve was successfully tested at its pressure setpoint. (Complete)
2. The CAR1 and CAR2 valves were tested since their preventive maintenance activity was scheduled for the upcoming refuel outage. The CAR1 valve was successfully tested at its pressure relief setpoint. The CAR2 valve failed to lift at its specified lift set pressure and exhibited minor seat leakage during testing. The valve was disassembled, cleaned and successfully retested. (Complete)
3. Dresden General Procedure (DGP) 2-3, Reactor Scram, and DGP 2-1, Unit Shutdown, were revised to check the CAR valve positions using their handle after a turbine trip. (Complete)
4. DGP 1-1, Unit Startup was revised to check the CAR valve tailpipe temperatures during startup activities. (Complete)
5. The procedure limits (DOP 5400-02) on warmup of SJAE system have been revised (Complete)
6. The System Engineer and Shift Manager were both counseled per MARC principles. (Complete)

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If you have any questions, please contact Frank Spangenberg, Dresden Regulatory Assurance Manager at (815) 942-2920 extension, 3800.

Sincerely,

J. M. Heffley
Site Vice President
Dresden Station

Enclosure

cc: Regional Administrator, Region III
NRC Resident Inspector's Office

1167

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3160-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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Supplement to Unit 3 Manual Scram Due to Decreasing Condenser Vacuum Caused By A Stuck Open Turbine Crossaround Relief Valve

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	N/A
05	16	98	98	004	01	08	31	98	FACILITY NAME: N/A	DOCKET NUMBER: N/A

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11)							
POWER LEVEL (10)	035		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
			20.2203(a)(2)(i)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.405(a)(1)(ii)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R. Jackson, Electrical Maintenance	(815) 942-2920 ext 2483

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	SB	RV	C710	Y						

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	x	NO				

ABSTRACT (Limit to 1400 spaces, i. e., approximately 15 single-spaced typewritten lines) (16)

On 5/16/98 at 2252 hours, Unit 3 was manually scrammed in response to a decrease in Main Condenser vacuum and increase in condensate demineralizer temperature, caused by the stuck open Main Turbine Crossaround Relief Valve Number 3 (CAR3). Prior to the manual scram, Operations experienced a decrease in Condenser vacuum during the initial main turbine reset and requested Engineering assistance in identifying possible air in-leakage. During investigation of the suspected air in-leakage, Plant Engineering personnel found that the CAR3 valve tailpipe was warmer than other CAR valve tailpipes. The Engineer and Operations personnel believed the valve was in satisfactory condition. The decrease in vacuum on the initial turbine reset was a result of air in the turbine supply piping due to the plant having been shutdown. The cause of this event was the CAR3 valve not being in the full closed position. The valve was disassembled and visually inspected and found to be slightly cocked, corrosion products and dirt build up on internal parts. It is suspected that the rust and dirt build-up on the disc holder prevented the proper closure of the valve. A contributing cause was failure to thoroughly investigate the leakage through the CAR3 valve. The safety significance was considered minimal since no emergency systems were needed to stabilize the plant following the scram. Subsequent to the scram, Group 2 and 3 isolation signals occurred as a result of the typical shrink in vessel level. All plant systems responded as designed. There were no identified occurrences where a CAR valve was found stuck open.

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power

Energy Industry Identification System (EIIS) Codes are identified in the text as [XX] and are obtained from IEEE Standard 805-1984, IEEE Recommended Practice for System Identification in Nuclear Power Plants and Related Facilities.

EVENT IDENTIFICATION:

Supplement to Unit 3 Manual Scram Due to Decreasing Condenser Vacuum Caused By A Stuck Open Turbine Crossaround Relief Valve.

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: 5/16/98 Event Time: 2252 CDT
Reactor Mode: 1 Mode Name: Run Power Level: 35 Percent
Reactor Coolant System Pressure: 1000 psig

Following a planned outage on Unit 3, plant personnel were in the process of performing startup activities. During startup, Operations personnel reset the main turbine [TA]. Upon resetting the turbine, Operations personnel perceived that a decrease in condenser vacuum indicated a possible air in-leakage pathway into the main condenser. Due to the observed vacuum decrease experienced during the main turbine reset on 5/15/98 at 1428 hours, Operations Department tripped the turbine and requested engineering assistance to identify potential air in-leakage paths to the main condenser.

During subsequent reset of the turbine on 5/15/98 at 1659 hours, condenser vacuum response was satisfactory. Discussions revealed the initial decrease in vacuum to be the result of air in the turbine steam supply piping due to the plant having been shutdown. It is typical to observe a decrease in condenser vacuum when initially resetting the turbine due to initial air influx into the condenser from the system steam piping. During the walkdown, the engineer observed that the tailpipe of the Main Turbine Crossaround Relief Valve Number 3 (CAR3) was warmer than other CAR tailpipes. This indicated that the CAR3 was passing steam to the 'A' section of the Main Condenser. This issue was discussed with Operations, where it was decided by the Engineer and Operation Shift Management that some minor valve leakage was acceptable and the CAR3 valve was in satisfactory condition for continuing the power ascension sequence. It was also noted that the CAR3 valve had been scheduled to perform its routine pressure testing during the next refuel outage.

Also during the startup, 'B' Steam Jet Air Ejector (SJAE)[SH] flow was oscillating severely and average capacity was below normal. Operations and the System Engineer confirmed that the oscillations and low capacity were not an instrument problem. They evaluated system performance as able to support continued plant operations because the SJAE drew and maintained a full vacuum. In addition, they forecast that the oscillations could be further investigated later in the startup because the other train was scheduled to be put in service in parallel for post maintenance tests. After plant shutdown, the SJAE flow oscillations were determined to be undamped system oscillations initiated by water passing through the SJAE in initial startup. The water was due to an abbreviated (but within procedural limits) warmup of the SJAE steam supply. This determination was confirmed by the following plant startup when SJAE startup was normal.

Unit 3 was synchronized to the grid at approximately 0552 hours on 5/16/98. The Unit's electrical output was increased to 288 MWe and preparations were in progress to place the feedwater heaters [SJ] in service.

B. DESCRIPTION OF EVENT:

This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(iv), which requires the reporting of any event or condition that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)[JC].

At approximately 1900 hours on May 16, 1998, flow oscillations which had been observed in SJAE 'B' increased from 0-120 SCFM to 0-300 SCFM. At this time, Operations discussed a contingency to manually scram the Unit if condenser vacuum decreased to 23 inches Hg or Condensate Demineralizer [SF] inlet temperature increased to 150 degrees.

At approximately 2145 hours, the NSO received an alarm for the Condensate To 'B' Gland Seal Condenser Temp Hi. A concern of Operations was that the "A" condenser hood vacuum was decreasing and that condensate demineralizer temperatures were increasing. Actions were taken to ensure that vacuum and condensate data were being closely monitored. Efforts to place the Feedwater Heaters [SJ] in service were delayed as a result of the abnormal conditions.

At approximately 2212 hours, the "RWCU Non-Regenerative Relief to Main Condenser Leak" annunciator was received. Operations secured the Reactor Water Cleanup system [CE] suspecting this relief may be open providing a source of heat input to the main condenser. The 'A' hood vacuum still continued to decrease and condensate temperature continued to trend upward. Operations reduced Reactor Recirculation [AD] flow to minimum and inserted control rods [AA] to decrease reactor power, in accordance with plant procedures. Additionally, Operations personnel were dispatched to fill the 'B' SJAE loop seals. Decreasing reactor power did not mitigate the observed decreasing condenser vacuum or increasing condensate temperatures. However, filling the loop seals did decrease oscillations in 'B' SJAE flow. Operations had planned to swap to the 'A' SJAE train once the Unit reached the Xenon soak, but discussed performing the swap during the loss of vacuum transient. Due to insufficient time, the 'A' SJAE train was not placed in service prior to the scram contingency setpoints being met.

Condensate demineralizer inlet temperature reached 149 degrees F and was continuing to increase, at which time the order to scram was made. On 5/16/98 at 2252 hours, Unit 3 was manually scrammed in response to the decrease in main condenser vacuum and increase in condensate demineralizer inlet temperature.

The manual scram of Unit 3 was inserted at a condenser vacuum of 23.9 inches Hg and decreasing. Subsequent to the scram, Group 2 and 3 isolation signals occurred as a result of the typical shrink in vessel level. All plant systems responded as design.

C. CAUSE OF EVENT:

The increase in condensate temperature and low condenser vacuum, which resulted in a manual scram, was caused by leakage through the CAR3 valve. During disassembly of the valve, maintenance personnel heard the valve reseat which indicated that the valve had been stuck open.

This abnormal condition is supported by the following facts: 1) The CAR3 valve tailpipe was found to be warmer than other CAR valve tailpipes during startup indicating that there was some amount of leak through. 2) The CAR3 discharges to the "A' section of the condenser, which is the hood that initially began to lose vacuum and degraded the most. 3) The discharge is below the main condenser tubes, which supports the rapid temperature change data.

Following the submittal of the initial LER, a root cause investigation was completed. The investigation revealed the following information concerning the event.

Upon inspection of the CAR3 valve, the stem was found slightly cocked to the side. The spindle was froze inside the spindle guide, some minor scratching (galling) was found on the guide and bushing, and rust and dirt build-up was found on the carbon steel components. The rust and dirt build-up is the normal as-found condition during CAR valve inspections. There was no major damage to internal parts. Field inspection of the valve as well as laboratory analysis indicated the valve stem galled in the bronze guide bushing. The cause of the galling could not be positively identified. It is suspected that the rust and dirt build-up on the disc holder where the ball of the spindle fits may have prevented the valve's disc from seating properly. This condition may have allowed the stem to hang-up slightly and caused a lateral force on the spindle that pushed against the spindle guide bushing. Based upon the field inspection and laboratory analysis this seems like the most plausible explanation of the stem sticking and not allowing the valve to re-seat.

A thermal loading analysis was also conducted on the valve and its piping. It concluded that there was no unacceptable thermal loading. The failure investigation also included a review of the preventive maintenance (PM) frequency and adequacy of the PM actions concerning CAR3 valve. The current PM program requires that the CAR valves be tested, disassembled and inspected at every 3 refuel (6 years) frequency. The valve manufacturer(GE) recommended that CAR valves be disassembled and inspected at approximately 5 years intervals. The investigation included a survey of the PM frequencies of eight nuclear plants with similar valves. The results of this survey revealed that Dresden's current PM frequency is within the average frequencies of the plants surveyed. Therefore, the PM frequency is found to be adequate.

The PM of the CAR valves is performed per procedures DMS 5600-03 and DMP 3000-01. The adequacy of these procedures were reviewed by a valve component engineer against the vendor manuals and found to be adequate. The component engineer did identify three minor items in DMS 5600-03 that should be clarified. This will be tracked per the NTS program.

The CAR1 and CAR2 valves were tested since their preventive maintenance activity was scheduled for the upcoming refuel outage. The CAR1 valve was successfully tested at its pressure relief setpoint. The CAR2 valve failed to lift at its set pressure and exhibited minor seat leakage during testing. The valve was disassembled, cleaned and successfully retested. Since the CAR2 valve would not reseat on its first pressure test, it was decided to perform a root cause analysis of this failure. The analysis involved a review of work request 980050457 and interview with the Turbine Project Manager who was present during the disassembly of the valve. The work request noted that the valve was found dirty internally and some nicks were found on the nozzle ring seat. The interview with the Turbine Project Manager confirmed the findings of dirt and nicks in the valve. It is believed that normal corrosion products might have been partially responsible for the valve test failure and not properly reseating.

A contributing cause of this event was found to be failure to investigate the CAR3 valve tailpipe temperature

increase. The failure to investigate the warm tailpipe temperature was caused by inattention to detail by the System Engineer and the Shift Manager. Neither individual maintained an adequate focus on the potential consequences of this condition.

The System Engineer did not realize the impact the valve leakage would have on the entire action of starting up the unit. The interview with the System Engineer indicated that he did not know the magnitude of the leakage. This was communicated to the Shift Manager as minimal leakage after investigating the loss of vacuum following reset of the main turbine and viewing the operation of the valve.

The most recent history of PM activities for the remaining four CAR valves on Unit 3 and the CAR valves on Unit 2 was reviewed and all valves exhibited no sticking and successfully passed their lift test. In addition, during Unit 3 startup from the manual scram, all six CAR valves that relieves from the CIVs had their tailpipe temperature monitored with no abnormalities observed. Consequently, the station is confident that all the CAR valves are in satisfactory condition to perform their design function.

D. SAFETY ANALYSIS

The safety significance of this event was limited to the fact that it was a challenge to Operations, as is every situation involving a need for prompt diagnosis and decision to manually trip the reactor. The Operations decision to manually scram was proper per procedure and pre-briefed in accordance with conservative decision making philosophy. With exception of the abnormalities causing and contributing to the need for a manual scram, plant equipment response was per design and required no operator action. No safety systems were needed in response to this event with exception of the expected automatic isolations designed to occur following a scram.

E. CORRECTIVE ACTIONS:

The following corrective actions were taken:

1. After replacement of all internal parts, the CAR3 valve was successfully tested at its pressure setpoint. (Complete)

2. The CAR1 and CAR2 valves were tested since their preventive maintenance activity was scheduled for the upcoming refuel outage. The CAR1 valve was successfully tested at its pressure relief setpoint. The CAR2 valve failed to lift at its specified lift set pressure and exhibited minor seat leakage during testing. The valve was disassembled, cleaned and successfully retested. (Complete)

3. Dresden General Procedure (DGP) 2-3, Reactor Scram, and DGP 2-1, Unit Shutdown, were revised to check the CAR valve positions using their handle after a turbine trip. (Complete)

4. DGP 1-1, Unit Startup was revised to check the CAR valve tailpipe temperatures during startup activities. (Complete)

5. The procedure limits (DOP 5400-02) on warmup of SJAE system have been revised (Complete)

6. The System Engineer and Shift Manager were both counseled per MARC principles. (Complete)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
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TEXT *(If more space is required, use additional copies of NRC Form 366A) (17)*

F. PREVIOUS OCCURRENCES:

A work history search was conducted of all the turbine CAR valves and only one work request was identified that involved a setpoint drift. During Unit 3 startup activities, Operations identified CAR3 valve was leaking through. Mechanical Maintenance Department removed the valve from the system per work request 920051859-01 to perform setpoint testing. Adjustments were subsequently made per procedure on April 22, 1992. CAR3 was found to lift at less than the setpoint.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number
Crosby	Crossaround Relief Valve	JB 26

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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SUBJECT: Forwards LER 98-004-01,describing manual RPS actuation due to decreasing condenser vacuum.Listed actions taken.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 2+6
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